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09/586,282	06/02/2000	Jonathan S. Yedidia	MERL-1272	6465

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Patent Department
Mitsubishi Electric Research Laboratories, Inc.
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EXAMINER	
THANGAVELU, KANDASAMY	
ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 09/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/586,282	Applicant(s) YEDIDIA ET AL.	
	Examiner Kandasamy Thangavelu	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 June 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-14* is/are rejected.

7)☒ Claim(s) *2 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 June 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Introduction

1. Claims 1-15 of the application have been examined.

Information Disclosure Statement

2. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications or other information submitted for consideration by the office, and MPEP § 609 A (1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered. Specifically, the specification makes references to various papers, patents and other publications on Pages 3, 4, 9, 14, 30, 47, 58, 59 and 60 of the specification, but the documents have not been included in a proper Information Disclosure statement. The applicants are requested to submit an IDS listing all the references, they wish considered. The applicants are also requested to send ***copies of all the non-patent references***, they wish to be considered

Drawings

3. The draft person has objected to the drawings; see a copy of Form PTO-948 for an explanation.

Abstract

4. The abstract is objected to because of the following informalities:

In Lines 6-7, "and each link is completed contained in at least one cluster" appears to be incorrect and it appears it should be "and each link is completely contained in at least one cluster".

Appropriate correction is required.

Specification

5. The disclosure is objected to because of the following informalities:

Page 6, Line 26, "and each link is completed contained in at least one cluster" appears to be incorrect and it appears it should be "and each link is completely contained in at least one cluster".

Page 16, Line 12, "that every link in the Markov network is completed included in at least one cluster" appears to be incorrect and it appears it should be "that every link in the Markov network is completely included in at least one cluster".

Page 45, Lines 13-14, "a simple line connected two nodes symbolizes a compatibility matrix" appears to be incorrect and it appears it should be "a simple line connecting two nodes symbolizes a compatibility matrix".

Page 48, Lines 3-5, "If ... network has no loops, one can standard belief-propagation to determine exactly the desired marginal probabilities" appears to be incorrect and it appears it should be "If ... network has no loops, one can apply standard belief-propagation to determine exactly the desired marginal probabilities".

Page 48, Lines 16-17, "we can make a modification to the loopy super-node method which guarantees that when it converges" appears to be incorrect and it appears it should be "we can make a modification to the loopy super-node method which guarantees that it converges".

Page 58, Lines 17-18, "which help to decode the message if it is arrives at a receiver in a corrupted form" appears to be incorrect and it appears it should be "which help to decode the message if it arrives at a receiver in a corrupted form".

Appropriate corrections are required.

Claim Objections

6. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

7. Claims 6 and 15 are objected to because of the following informalities:

Claim 6, Lines 1-2, "the termination condition is a convergence the probabilities of the states of the system to a predetermined precision" appears to be incorrect and it

appears that it should be "the termination condition is a convergence of the probabilities of the states of the system to a predetermined precision".

Claim 15, Lines 7-8, "and each link is completed contained in at least one cluster" appears to be incorrect and it appears it should be "and each link is completely contained in at least one cluster".

Appropriate corrections are required.

Claim Interpretations

8. In Claim 6, Lines 1-2, "the termination condition is a convergence the probabilities of the states of the system to a predetermined precision" has been interpreted as "the termination condition is a convergence of the probabilities of the states of the system to a predetermined precision".

In Claim 15, Lines 7-8, "and each link is completed contained in at least one cluster" has been interpreted as "and each link is completely contained in at least one cluster".

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

10. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1 and 3-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Freeman et al.** (FR) (U.S. Patent 6,496,184) in view of **Heckerman** (HE) (U.S. Patent 6,529,891), and further in view of **Skaaning et al.** (SK) (U.S. Patent 6,535,865).

11.1 FR teaches Method for inferring scenes from test images and training data using probability propagation in a Markov network. Specifically, as per Claim 1, FR teaches a method for determining probabilities of states of a system represented by a model including a plurality of nodes connected by links, each node representing possible states of a corresponding part of the system, and each link representing statistical dependencies between possible states of related nodes (CL2, L56-58; Fig. 3; CL3, L35-67); comprising:

grouping the plurality of nodes into arbitrary-sized clusters (Fig. 2; CL3, L35-58);

assigning initial values to the messages (CL2, L33-35);

updating the value of each message using the associated rule (CL2, L33-35); and

determining approximate probabilities of the states of the system from the messages when a termination condition is reached (CL2, L33-35).

FR does not expressly teach grouping the plurality of nodes into arbitrary-sized clusters such that every node is included in at least one cluster and each link is completely contained in at least one cluster. HE teaches grouping the plurality of nodes into arbitrary-sized clusters such that every node is included in at least one cluster and each link is completely contained in at least one cluster (CL1, L61-65; CL7, L20-37), as clustering reduces the amount of processing time when predicting the probabilities (CL6, L35-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR with the method of HE that included grouping the plurality of nodes into arbitrary-sized clusters such that every node is included in at least one cluster and each link is completely contained in at least one cluster, as clustering would reduce the amount of processing time when predicting the probabilities.

FR does not expressly teach defining messages based on the arbitrary-sized clusters, each message having associated sets of source nodes and destination nodes and a value and a rule depending on other messages and selected links connecting the source nodes and destination nodes. SK teaches defining messages based on the arbitrary-sized clusters, each message having associated sets of source nodes and destination nodes and a value and a rule depending on other messages and selected links connecting the source nodes and destination nodes (CL3, L22-23), as the message passing scheme can update the beliefs and probabilities of unobserved nodes given the observed nodes (CL3, L22-23). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR with the method of SK that included defining messages based on the arbitrary-sized clusters, each message having

associated sets of source nodes and destination nodes and a value and a rule depending on other messages and selected links connecting the source nodes and destination nodes, as the message passing scheme can update the beliefs and probabilities of unobserved nodes given the observed nodes.

Per Claim 3: FR teaches that the network has pair-wise statistical dependencies between nodes, and the overall probability of a particular assignment of states s at the nodes is:

$$P(S_1, S_2, \ldots S_N) = (1/Z) \prod_{i,j} \phi_{ij}(S_i, S_j) \prod_i \psi(S_i),$$

where the first product runs overall linked neighboring nodes, i and j, and wherein a ϕ compatibility matrix represents the statistical dependencies between the possible states s of the related nodes, and the ψ function for each node represents evidence that a particular node is in a particular state, and Z is a normalization constant to insure that the sum of the probabilities of all possible states of the system is equal to one (CL6, L5-21).

Per Claim 4: FR does not expressly teach that the initial values of the messages are random positive numbers. HE teaches that the initial values of the messages are random positive numbers (CL16, L64 to CL17, L6), because as per SK the usual procedure for eliciting the probabilities is for one domain expert to give initial probabilities (CL15, L28-31), so the probabilities of actions and questions can be estimated (CL16, L38-39). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR with the method of HE that included the initial values of the messages being random positive numbers, because the usual procedure for eliciting the probabilities would be

for one domain expert to give initial probabilities so the probabilities of actions and questions could be estimated.

Per Claim 5: FR teaches that the initial values of the messages are all ones (CL6, L20-21).

Per Claim 6: FR teaches the termination condition is a convergence the probabilities of the states of the system to a predetermined precision (CL2, L35-36).

Per Claim 7: FR does not expressly teach that the approximate probabilities are marginal probabilities. SK teaches that the approximate probabilities are marginal probabilities (CL2, L60 to CL3, L4), as the conditional probability reduces to marginal probability if the node does not depend on other nodes (CL3, L3-4). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR with the method of SK that included the approximate probabilities being marginal probabilities, as the conditional probability would reduce to marginal probability if the node did not depend on other nodes.

Per Claim 8: FR teaches the approximate probabilities are maximum a posteriori probabilities (CL5, L62-65).

Per Claim 9: FR does not expressly teach that the states are discrete. HE teaches that the states are discrete (CL7, L53-58), as the states may contain combinations of discrete and continuous variables (CL13, L26-27). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR with the method of HE that

included states being discrete, as the states would contain combinations of discrete and continuous variables.

Per Claim 10: FR does not expressly teach that the states are continuous. HE teaches that the states are continuous (CL7, L53-58), as the states may contain combinations of discrete and continuous variables (CL13, L26-27). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR with the method of HE that included states being continuous, as the states would contain combinations of discrete and continuous variables.

Per Claim 11: FR teaches the network model includes closed loops (CL5, L66 to CL6, L4).

12. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Freeman et al.** (FR) (U.S. Patent 6,496,184) in view of **Heckerman** (HE) (U.S. Patent 6,529,891), and further in view of **Skaaning et al.** (SK) (U.S. Patent 6,535,865) and **Bertsekas et al.** (BE) ("Data Networks", Prentice Hall, 1992).

12.1 As per Claim 12, FR, HE and SK teach the method of Claim 1. FR, HE and SK do not expressly teach that the nodes are arranged in a square lattice. BE teaches that the nodes are arranged in a square lattice (Pg 181, Fig. 3.11 and 3.12), as the systems having two independent class of customers each with its own statistical characteristics can be represented by nodes forming a square lattice (Pg 180, Para 1 and 2; Pg 181, Fig. 3.11 and 3.12). It would have been

obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR, HE and SK with the method of BE that included the nodes arranged in a square lattice, as the systems having two independent class of customers each with its own statistical characteristics could be represented by nodes forming a square lattice.

Per Claim 12, FR, HE and SK do not expressly teach that the nodes are arranged in a triangular lattice. BE teaches that the nodes are arranged in a triangular lattice (Pg 181, Fig. 3.11 and 3.12), as the systems having multiple independent class of customers each with its own statistical characteristics can be represented by nodes forming a square lattice (Pg 185, Example 3.14 and Fig. 3.15). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR, HE and SK with the method of BE that included the nodes arranged in a triangular lattice, as the systems having multiple independent class of customers each with its own statistical characteristics could be represented by nodes forming a triangular lattice.

13. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Freeman et al.** (**FR**) (U.S. Patent 6,496,184) in view of **Heckerman** (HE) (U.S. Patent 6,529,891), and further in view of **Skaaning et al.** (SK) (U.S. Patent 6,535,865) and **Helfenstein et al.** (HEL) (U.S. Patent 6,282,559).

13.1 As per Claim 14, FR, HE and SK teach the method of Claim 1. FR, HE and SK do not expressly teach that the nodes and links are a Markov network representation of an

error-correcting code. HEL teaches that the nodes and links are a Markov network representation of an error-correcting code (CL2, L36-40), as the error correcting code is closely related to the probability distribution (CL4, L50-62). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of FR, HE and SK with the method of HEL that included the nodes and links being a Markov network representation of an error-correcting code, as the error correcting code would be closely related to the probability distribution.

Allowable Subject Matter

14. Claims 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The claim would be allowable as intersections of clusters and grouping the nodes in the intersection of clusters as regions of nodes and defining messages based on the regions of nodes is not taught by prior art.

15. Claim 15 would be allowable if rewritten to overcome the objections indicated in Paragraph 7 above. The claim would be allowable as intersections of clusters and grouping the nodes in the intersection of clusters as regions of nodes, identifying the intersections of regions as sub-regions and defining messages between regions and sub-regions is not taught by prior art.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to the Applicants' disclosure.

The following patents and papers are cited to further show the state of the art at the time of Applicants' invention with respect to Markov networks, clustering and state probability evaluation.

1. Freeman et al., "Learning low-level vision", IEEE, September 1999.
2. Ostendorf et al., "Speaker independent model generation ...", U.S. Patent 5,839,105, November 1998.
3. Kosaka et al., "Tree-structured speaker clustering ...", IEEE 1994.
4. Fung et al., "An architecture for probabilistic concept based information retrieval", ACM 1990.
5. Roberts, "Explanation generation system for a diagnosis support tool ...", U.S. Patent 6,601,055, July 2003.
6. Komori et al., "State transition model design method ...", U.S. Patent 5,812,975, September 1998.
7. Bauman et al., "Artificial intelligence software shell for plant operation simulation", U.S. Patent 5,412,756, May 1995.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-746-7329.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
August 13, 2003

RUSSELL FREJD
PRIMARY EXAMINER